



Explanatory Note to Decision 2018/010/R

CS-25 Amendment 22

RELATED NPA/CRD 2017-18 – RMT.0397

EXECUTIVE SUMMARY

CS-25 is amended to implement the outcome of rulemaking task RMT.0397 ‘Unintended or inappropriate rudder usage — rudder reversals’.

The objective is to mitigate the safety risk that stems from pilots of large aeroplanes applying inappropriate rudder control inputs, in particular pedal reversals, which may create structural loads that exceed limit loads, or even ultimate loads. This may lead to the failure of primary structure and/or flight controls, and then to a catastrophic loss of control of the aeroplane. This amendment ensures that large aeroplanes are designed with features that protect the structure against rudder control pedal reversals like the ones demonstrated in several reported occurrences. This will ensure an increased level of safety, while creating little or no economic impact in most of the cases.

| | | | |
|-------------------------------|---|------------------------------|----------|
| Action area: | Aircraft upset in flight (LOC-I) | | |
| Affected rules: | CS-25 | | |
| Affected stakeholders: | Design organisations — large aeroplanes | | |
| Driver: | Safety | Rulemaking group: | No |
| Impact assessment: | Light | Rulemaking Procedure: | Standard |

● EASA rulemaking process

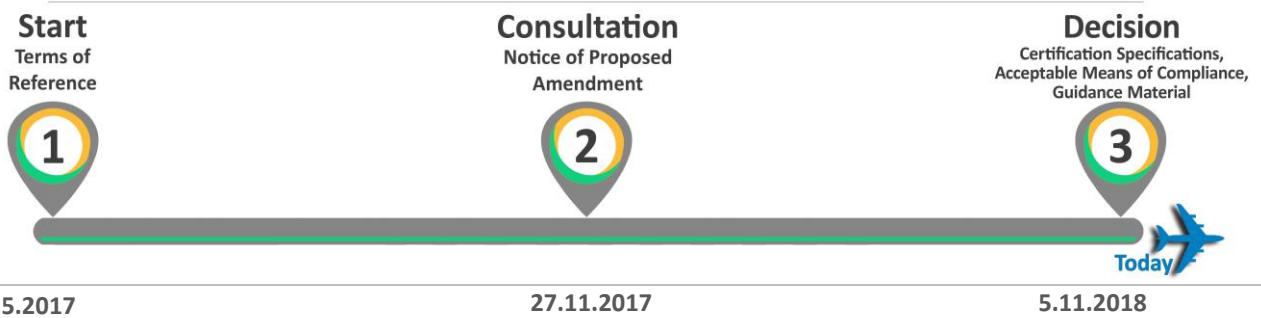


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1. About this Decision

The European Aviation Safety Agency (EASA) developed ED Decision 2018/010/R in line with Regulation (EU) 2018/1139¹, (hereinafter referred to as the 'Basic Regulation') and the Rulemaking Procedure².

This rulemaking activity is included in the European Plan for Aviation Safety (EPAS)³ under Rulemaking Task (RMT).0397. The scope and timescales of the task were defined in the related Terms of Reference⁴.

The draft text of this Decision has been developed by EASA. All the interested parties were consulted through Notice of Proposed Amendment (NPA) 2017-18⁵. 52 comments were received from all the interested parties, including industry and national aviation authorities.

EASA reviewed the comments received during the consultation. The comments received and EASA's responses to them are presented in Comment-Response Document (CRD) 2017-18⁶.

The final text of this Decision, with the certification specifications (CSs) and acceptable means of compliance (AMC), has been developed by EASA.

The major milestones of this regulatory activity are presented on the title page.

¹ Regulation (EU) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, and amending Regulations (EC) No 2111/2005, (EC) No 1008/2008, (EU) No 996/2010, (EU) No 376/2014 and Directives 2014/30/EU and 2014/53/EU of the European Parliament and of the Council, and repealing Regulations (EC) No 552/2004 and (EC) No 216/2008 of the European Parliament and of the Council and Council Regulation (EEC) No 3922/91 (OJ L 212, 22.8.2018, p. 1) (<https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1535612134845&uri=CELEX:32018R1139>)

² EASA is bound to follow a structured rulemaking process as required by Article 115(1) of Regulation (EU) 2018/1139. Such a process has been adopted by the EASA Management Board (MB) and is referred to as the 'Rulemaking Procedure'. See MB Decision No 18-2015 of 15 December 2015 replacing Decision 01/2012 concerning the procedure to be applied by EASA for the issuing of opinions, certification specifications and guidance material (<http://www.easa.europa.eu/the-agency/management-board/decisions/easa-mb-decision-18-2015-rulemaking-procedure>).

³ https://www.easa.europa.eu/document-library/general-publications?publication_type%5B%5D=2467

⁴ <https://www.easa.europa.eu/document-library/terms-of-reference-and-group-compositions>

⁵ In accordance with Article 115 of Regulation (EU) 2018/1139 and Articles 6(3) and 7 of the Rulemaking Procedure.

⁶ <https://www.easa.europa.eu/document-library/comment-response-documents>



2. In summary — why and what

2.1. Why we need to change CS-25

Service experience and occurrence investigations show that, regardless of training, some pilots of large aeroplanes used in commercial air transport make inadvertent and erroneous rudder inputs. Some pilots may also misunderstand what the manoeuvring speed is and the extent of structural protection that exists when an aeroplane is operated at speeds below its manoeuvring speed.

Applying inappropriate rudder control inputs, in particular pedal reversals, may create structural loads that exceed the limit loads or even the ultimate loads. The worst-case scenario is a failure of part of the primary structure and/or the flight controls, which can lead to a catastrophic loss of control of the aircraft.

2.2. What we want to achieve — objectives

The overall objectives of the EASA system are defined in Article 1 of the Basic Regulation. This proposal will contribute to the achievement of the overall objectives by addressing the issue outlined in Section 2.1.

The specific objective is to:

- mitigate, through design-related measures, the safety risk created by unintended or inappropriate rudder control (e.g. pedal) usage by pilots of large aeroplanes, in particular multiple rudder pedal reversals, which can lead to overstress and failure of primary structure and/or flight controls, and, consequently, loss of control of the aeroplane; and
- clarify the specification for provisions to be included in the aeroplane flight manual (AFM) to alert the flight crew to the risk from rapid and large alternating control inputs in relation with the manoeuvring speed.

2.3. How we want to achieve it — overview of the amendments

CS-25 is amended in order to:

- create a new CS 25.353 yaw manoeuvre condition, consisting of a two-pedal doublet manoeuvre, and related AMC 25.353; and
- clarify CS 25.1583(a)(3) regarding manoeuvring speed limitation statements in the AFM, and amend the related AMC 25.1581.

2.4. What are the stakeholders' views

The most substantial comments came from some aeroplane manufacturers who recommended a single rudder pedal doublet instead of a double rudder pedal doublet. The position of these manufacturers corresponds to position 2 recorded in the Flight Controls Harmonization Working Group (FCHWG) report; please refer to paragraph 4.1.1.2 in NPA 2017-18 for more details. Other aeroplane manufacturers did not object to the proposal, and that was also the case during the consultation of the equivalent EASA Special Condition at the end of 2015. The comments received did not add any new elements that would justify a change of the EASA position.

Other comments were aimed at clarifying or improving the proposed amendment, or supporting it.



2.5. What are the benefits and drawbacks

The new CS 25.353 specification for a yaw manoeuvre condition consisting of a two-pedal doublet manoeuvre ensures that large aeroplanes are designed with features that protect the structure against rudder control pedal reversals like the ones in the reported occurrences. This will bring an increased level of safety, while creating little or no economic impact in most of the cases. For some aeroplanes, mainly the ones designed with a manual flight control system (FCS), the economic impact may be higher than for the ones with a fly-by-wire FCS or a hydromechanical FCS. However, the current trend in designs is to move away from mechanical systems and towards electronic control systems; EASA estimates that the economic impact remains reasonable and acceptable to the manufacturer when a new design is developed. Furthermore, several existing designs are already able to comply with the new specification.

The amendment of CS 25.1583(a)(3) will ensure that AFMs adequately warn flight crews of the risk that stems from large and rapid alternating control inputs in relation to the manoeuvring speed, thus decreasing the risk of inappropriate flight control system inputs, including rudder pedal inputs; no economic impact would be induced by this specification. It also removes an existing inconsistency, which can create confusion between the 'manoeuvring speed' and the 'design manoeuvring speed V_A '.

2.6. How do we monitor and evaluate the rules

This amendment applies to new aeroplane type designs, and to some changes to existing large aeroplanes (in this latter case, the suitability to include the new rule in the certification basis is determined on a case-by-case basis, in application of Part-21 (e.g. points 21.A.16, 21.A.101)).

Therefore, the monitoring of the effects created by the new specifications and acceptable means of compliance will consist of:

- 1) feedback from future CS-25 certification projects, and
- 2) in the long term, monitoring the trend of incidents and accidents that involve the inappropriate usage of the rudder control (i.e. multiple pedal reversals) .

Item 1 depends on the applications received after the amendment of CS-25. A review cannot be made earlier than 5 years after the CS-25 amendment.

Item 2 will allow EASA to evaluate the efficiency and adequacy of the new CS 25.353 rule when an occurrence concerns an aeroplane certified in compliance with this rule. Whenever the occurrence concerns an aeroplane that does not have the new CS 25.353 rule in its certification basis, the analysis of the occurrence will be used by EASA and type certificate holders to determine whether an unsafe condition exists, and whether mandatory corrective actions must be taken in agreement with Part-21, point 21.A.3B.

The monitoring will be ensured in the frame of the usual continuing airworthiness process followed by EASA and type certificate holders, and also through the investigations of occurrences and safety recommendations from designated safety investigation authorities.



3. References

3.1. Affected decisions

- Decision No. 2003/2/RM of the Executive Director of the European Aviation Safety Agency of 17 October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for large aeroplanes (« CS-25 »).

3.2. Other reference documents

- Federal Register / Vol. 76, No. 59 Monday, March 28, 2011 / Notices - Notice of new task assignment for the Aviation Rulemaking Advisory Committee (ARAC) on rudder pedal sensitivity and rudder reversals. Task assigned to the re-established Flight Controls Harmonization Working Group, under Transport Airplane and Engine Issues
<https://www.gpo.gov/fdsys/pkg/FR-2011-03-28/pdf/2011-7180.pdf>
- Report submitted to the FAA by the Aviation Rulemaking Advisory Committee (ARAC) and the Flight Controls Harmonization Working Group (FCHWG) of the Transport Airplane and Engine Subcommittee, dated 30 December 2013
https://www.faa.gov/regulations_policies/rulemaking/committees/documents/index.cfm/document/information/documentID/550



4. Appendices

Appendix to Decision 2018/010/R 'CS-25 Amendment 22' — CRD 2017-18

